Supporting information

SnS Homojunction Nanowires-based Solar Cells

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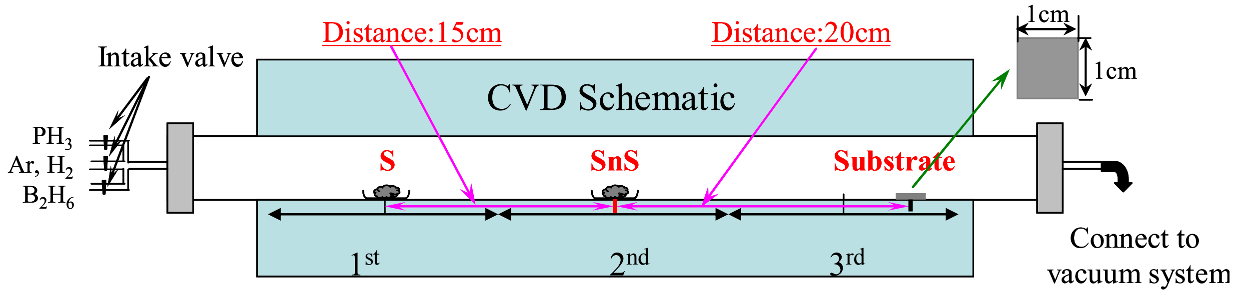
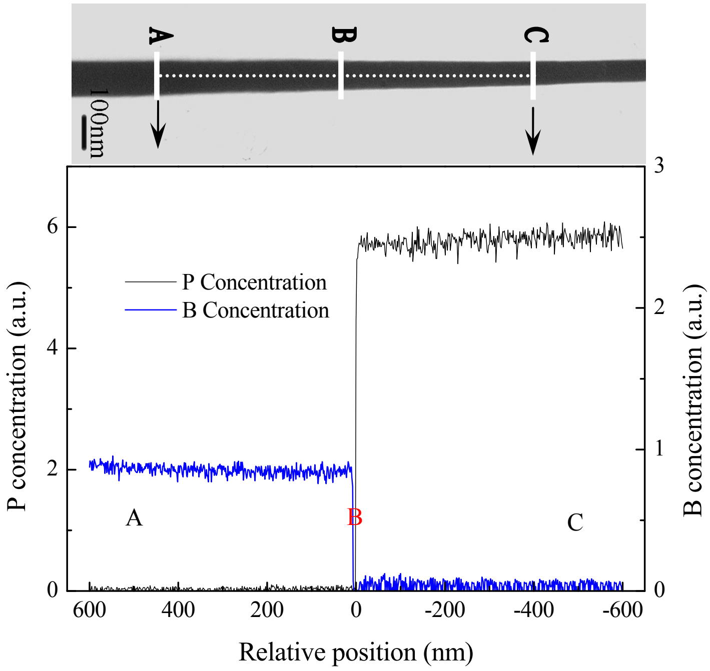
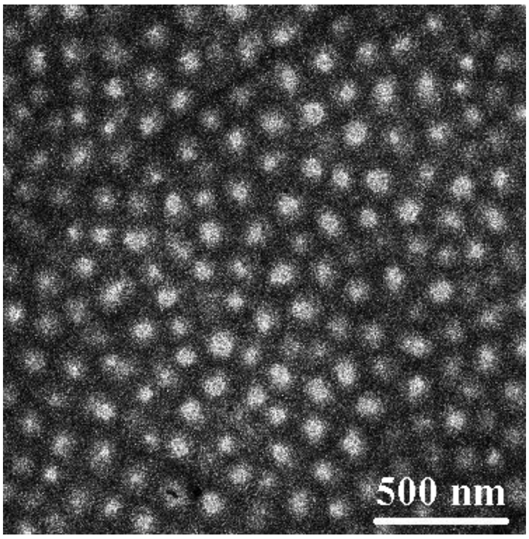


Supporting Fig. 1 Illustration of the experimental apparatus



Supporting Fig. 2 The EDS results showing the signals for B element (blue lines) and P element (black lines) alone the growth direction of SnS Nanowire.

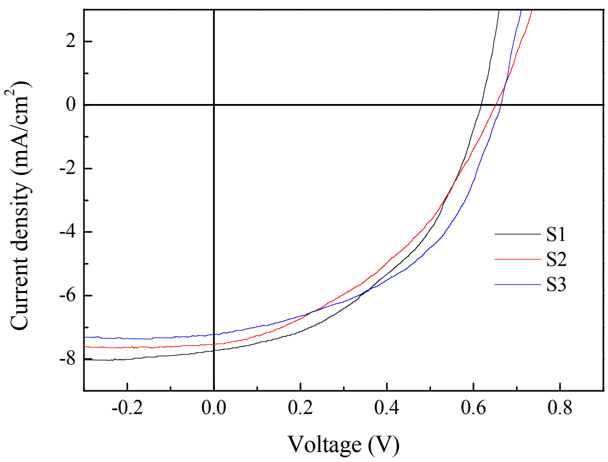
For spots scanned at the n-type region, elemental signals of Sn, S, and P appeared together without apparent presence of B signals. As the scanned spots crossed the interface of p-n junction and moved further into the p-type region, the elemental signals of P disappeared and B appeared suddenly. It is apparent that the doping concentration of the P element in the n-type segment is distributed uniformly not only along the growth direction as well as the B element in the p-type segment. And between the region of P element disappeared and B element appeared, there is an interval about 10 nm, this maybe attribute to the experiment operating step. It needs a little time for us to turn off the B_2H_6 gas and turn on the PH_3 gas, so there may be about 10 nm region without doping. But to some reference, this region is p-type also.[1-4] This is also accord with the HR-TEM image with clear lattice spacing trace.



Supporting Fig. 3 SEM image of SnS nanowire tips exposed above the photoresist layer.

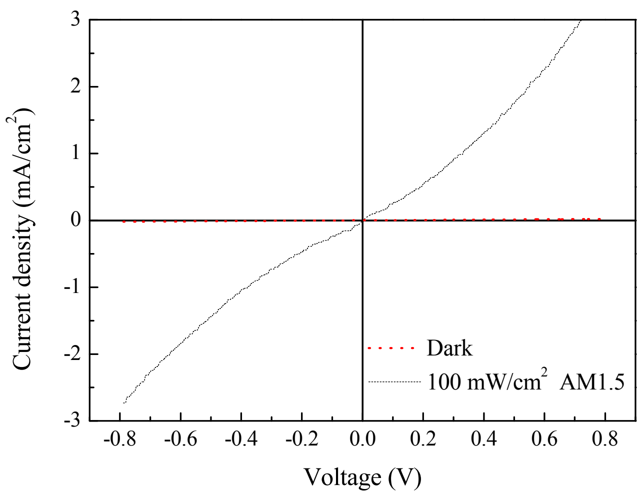
The following picture indicated that the other three solae cell were characterized under simulated AM1.5G illumination with intensity of 100 mW/cm^2. This three samples which the nanowire arrays were synthesized with the same experiment parameter and were assembled to solar cell with the same process. From this picture, the value of the open-circuit voltage in the different samples ranged from 0.617 V to 0.663

V, and the value of the short-circuit current density in the different samples ranged from 7.74 mA/cm^2 to 7.22 mA/cm^2. From this results, it can be indicated that in our experiment with the same experiment parameter, approximate results can be obtained.



Supporting Fig. 4 Current density vs voltage for the solar cell under simulated AM1.5G illumination with intensity of 100 mW/cm^2.

The SnS nanowires were synthesized with the same condition on the Al foil, just without the PH_3 and B_2H_6 gas. As the reference report that the as synthesized SnS nanowires are p-type semiconductor materials.[1-4] These SnS nanowires were fabricated to the simple solar cell divice with the same way as our paper report. The current–voltage ($I-V$) characteristics of the SnS nanowires sandwiched between ITO and Al contacts, in the dark and under 100 mW cm^{-2} AM1.5 solar illumination are shown in supporting figure 5. These measurements show that the SnS nanowires act as photoconductors. There is negligible photovoltaic behaviour, indicating the absence of any significant Schottky barrier formed at the nanowires/electrode interface. This result indicated that the rectifying behavior was not coming from the interface contacts or the rectifying behavior between the nanowires/electrode interface is very weak and can be ignored.



Supporting Fig. 5 The current–voltage ($I-V$) characteristics of the SnS nanowires sandwiched between ITO and Al contacts.

References

1. Reddy, K.T. R.; Reddy, N. K.; Miles, R.W. Photovoltaic properties of SnS based solar cells. *Sol. Energy Mater. Sol. Cells* 2006, **90**, 3041-3046.
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